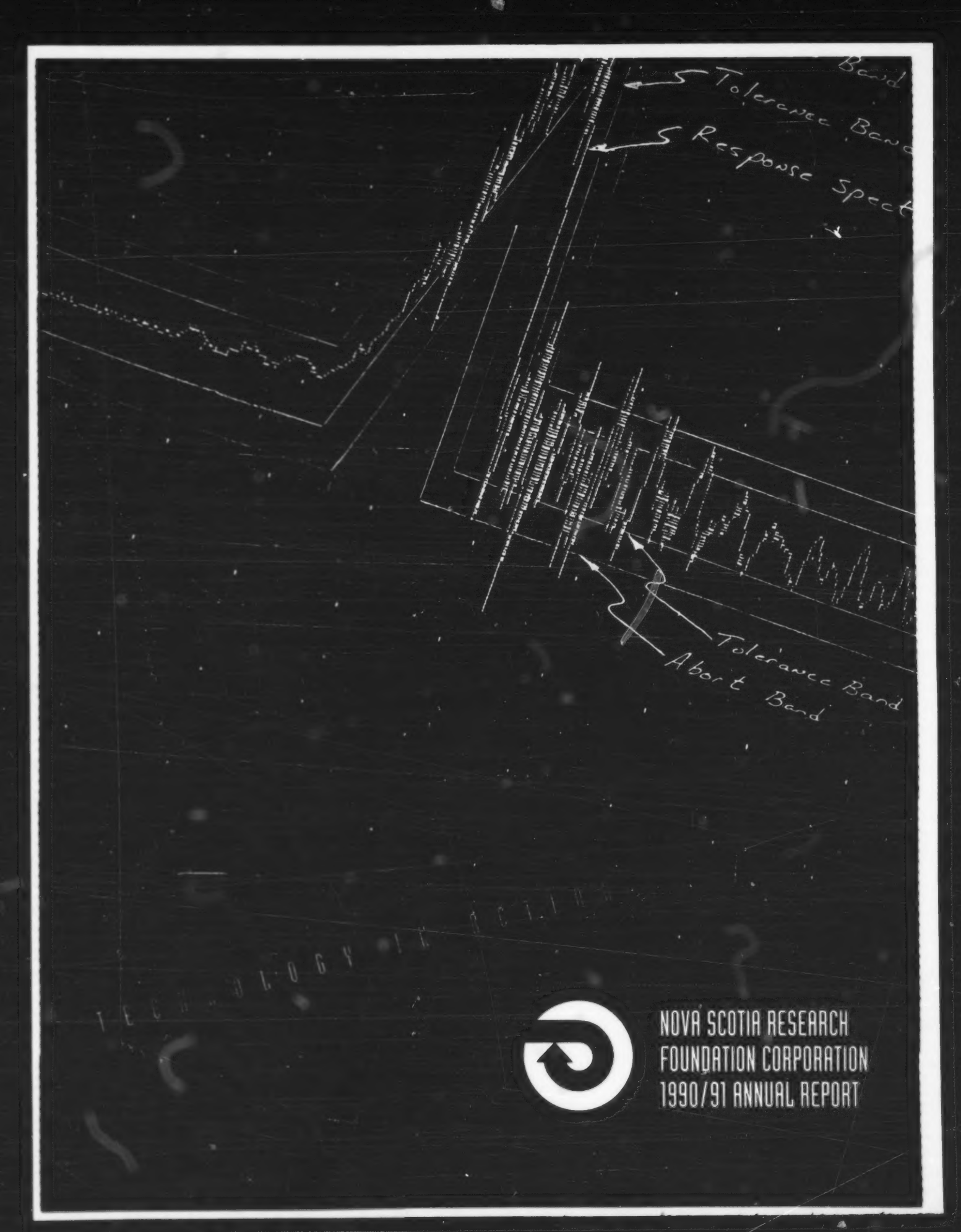


NOVA SCOTIA RESEARCH FOUNDATION CORPORATION 1990/91 ANNUAL REPORT

92-00669/

CORPORATE PROFILE

Nova Scotia Research Foundation Corporation was established in 1946 by the Province of Nova Scotia to use science and technology to assist in the economic development of Nova Scotia. Three operating divisions - Applied Science, Industry Services and Product Development - carry out technical assignments for 700 companies and government departments each year. The Corporation pursues two main goals - assistance to industry in the solution of today's technical problems and product process innovation in anticipation of tomorrow's opportunities.

APPLIED SCIENCE

Technical services and applied R & D for industry and government.

Laboratory Services

Analytical and Environmental Chemistry

- Lube oil and fuels analysis
- Environmental monitoring of waste oils, process effluents and sediments
- Pressure-treated wood quality control
- Indoor air-quality monitoring

Biology

- Microbiological analysis
- Food quality and sanitation surveys

Materials

- Mechanical and metallurgical testing
- Welding procedure qualifications
- Failure analysis
- Corrosion analysis
- Forensic Engineering

Research and Development

Biotechnology

- Biological fertilizers
- Forestry tissue culture
- Biodegradation of pollutants
- Horticultural micropropagation

Materials R & D

- Ceramics
- Corrosion

Coal and Minerals

- Coal processing technologies
- Chemicals from minerals
- Solid waste management

Industrial Wastewater

- Oil/water separation
- Removal of heavy metals
- Hazardous organics reduction
- Containment of radionuclides

Information and Geophysics

- Data compilation, processing and interpretation
- Geophysical equipment sales

INDUSTRY SERVICES

Technical assistance to small and medium-sized manufacturers to improve productivity and technological capabilities.

Field Service

- National Research Council's IRAP Program
- Technical information literature searches
- In plant problem solving
- Technology transfer/acquisition
- Technology patent searches

Technical People in Industry Program

- Financial support for new skills to industry

Project Services

- Technical market analysis
- Bioresource machine applications engineering
- Mathematics and computer applications

Library

- Computer database searches
- Technical searches

PRODUCT DEVELOPMENT

New Product Development

- Engineering
- Manufacturing
- Marketing
- Mechanical/electronic engineering and design assistance
- CAD/CAM familiarization
- Quality assurance

Export Sales

- Diving life-support equipment
- Underwater instrumentation
- Magnetically coupled, zero-leakage blowers and pumps
- Magnetic drives for original equipment manufacturing applications

Accident Reconstruction

Environmental Testing

- Temperature
- Thermal shock
- Humidity
- Vibration
- Mechanical shock
- Hydrostatic pressure
- Altitude
- Salt fog/spray
- Rain
- Sunshine
- Fungus growth
- Package testing
- Combined environments
- Sound level measurements

PRESIDENT'S REPORT

T.B. Nickerson, P.Eng., President

The Honourable Thomas J. McInnis, Minister
Department of Industry, Trade and Technology
Province of Nova Scotia, Halifax, Nova Scotia

Sir:
I have the honour of submitting the forty-fourth Annual Report of the Nova Scotia Research Foundation Corporation.

Respectfully yours,

T. B. Nickerson, P. Eng., President
Nova Scotia Research Foundation Corporation
Dartmouth, Nova Scotia
September 1, 1991

Voluntary Planning's economic strategy consultation paper *Our Province, Our Future, Our Choice* identifies technology as a key lever for economic development in Nova Scotia, and outlines three principles for a technology strategy:

- Nova Scotia should utilize the rich resources of existing industrial strength and current R&D accomplishments.
- Nova Scotia should develop R&D capabilities to meet the technological needs of Nova Scotia-owned firms.
- Nova Scotia should make the development and application needs of industry its first research priority.

The emphasis on the application of technology in industry is, we believe, essential. Only after technology is applied in industry are wealth and jobs created. The Voluntary Planning document recognizes that in Nova Scotia, the application end of the R&D spectrum is the most in need of attention and the most likely to generate results.

The Nova Scotia Research Foundation's three-year plan, emphasizing service to small and medium-sized enterprises (SMEs), reflects the same theme. While we will continue to provide the highest quality scientific and technical (S&T) services to government and large companies, NSRFC's initiatives will focus on the needs of indigenous companies, the vast majority of whom are SMEs. These companies are, on average, slower adopters of technology than large companies who have corporate technology resources. Our objective is to have a cohesive set of cost-effective S&T services to assist indigenous companies to enhance their products, their productivity and their quality, and to do so in an environmentally friendly way.

We will continue to emphasize cooperation. Nova Scotia has a plethora of educational and R&D establishments, almost all of which have an interest in the technological needs of SMEs. The wise use of scarce resources requires that this community work together, ideally as a single entity, to ensure that science and technology make the maximum contribution to the generation of wealth and jobs in Nova Scotia.

The role of NSRFC is best illustrated by its diverse client base. In the past year the Corporation carried out 4281 technical assignments for over 654 clients, 73% of whom are Nova Scotia companies. Assignments ranged from literature searches to new product developments and multidisciplinary R&D projects, all aimed at helping the client apply technology to enhance competitiveness. For many assignments we call on universities and other R&D organizations across Canada to address the specialized technical problems of our diverse clientele.

Income increased 10.3% to $6.7 million, largely as the result of a 16.6% increase in contract revenue. Two one-time items resulted in an overall net loss of $198,089. Following our decision to move out of geophysical surveys, we realized a one-time gain of $263,380 from the sale of survey equipment. The Corporation took a one-time charge of $460,000 to cover the projected costs of a voluntary early retirement plan introduced late in the year.

I would like to express our thanks to both the Atlantic Canada Opportunities Agency and the Nova Scotia Department of Industry, Trade and Technology who assisted the Corporation during the year in the continual renewal of our capital equipment base.

November 7, 1990, was a special day for NSRFC. In the morning the Honourable Donald Cameron, at that time Minister of Industry, Trade and Technology, and Senator Michael Forrestal, representing the Atlantic Canada Opportunities Agency, officially opened NSRFC's Environmental Test Centre. In the afternoon and evening over 500 clients, colleagues and friends attended NSRFC's triennial Open House.

The Environmental Test Centre (ETC) is the first common-user facility in Atlantic Canada where manufacturers can test their products in extreme temperature, humidity, shock, and vibration conditions and have them certified to various military and industrial environmental standards.

The success of the Corporation is the result of dedicated service by many people. I would like to express my sincere thanks to the hardworking staff of NSRFC and to the wise counsel of the Board of Directors. John Helliwell, our Vice-President - Industry Services, retired during the year after a 20-year career with NSRFC. Dr. Kelvin Ogilvie, who stepped down from the Board of Directors, will continue to maintain an interest in NSRFC's biotechnology activity. At year end we welcomed the Honourable Tom McInnis as the new Minister responsible for the Nova Scotia Research Foundation Corporation Act.

The Corporation is constantly evolving in response to new technologies and to changing client needs. Managing the process of change within the organization will be a key to our effectiveness in serving our clients' needs in the 1990s. We look forward to the challenges.

APPLIED SCIENCE

LABORATORY SERVICES

Analytical & Environmental Chemistry

We provided a wide range of chemical analysis services to about 300 clients, 80% of whom were from N.S. industry. Substances ranged from used lubricating oil to metals, food and pressure-treated wood.

Over 50% of the work was directly related to the environment. We analyzed waste oil to provide information on disposal options, tested soils and other solids for leachable heavy metals, and checked water for polyaromatic hydrocarbons. Several indoor air quality surveys were conducted in offices and process facilities. For many firms, we identified asbestos fibres in bulk samples or counted them in air samples.

Materials

We carried out 20% more assignments than last year. Our welding and welder procedure qualification testing services were in great demand due to the increase in offshore activity, as were our mechanical testing services. We completed failure analyses on engine components, propellers, impellers and shaft materials, and on domestic and industrial corrosion.

Forensic studies covered a variety of vehicle problems, and domestic and commercial fires.

Microbiology

Industry and government provided strong demand this year for our microbiological services. We tested for a variety of bacteria, yeasts and molds in water, foods, plant effluents and fuels. Sanitation surveys of food-processing and preparation facilities were also conducted.

Clients use our tests results for routine quality control, product development and problem-solving.

RESEARCH & DEVELOPMENT

Biotechnology

The first year of a multi-year program to improve Christmas trees has been completed. In collaboration with Dalhousie University and the Christmas Tree Council of Nova Scotia, the project is developing tissue culture techniques for propagating superior varieties of balsam fir.

In collaboration with the British Columbia Research Corporation and Silvagen Inc., we are investigating the commercial feasibility of using proven tissue culture techniques to deliver improved planting stock for forest regeneration. A consortium of provincial agencies and Canadian forest products companies, under the name BIOTIA may be formed as a result of this study to assist with a pilot project.

Through micropropagation, we supplied 18,000 disease-free strawberry and blackberry planting stock to Nova Scotia nurseries in the spring of 1990.

Our research funded under the Federal/Provincial Agricultural Agreement has shown that manipulation of mycorrhizal associations may help strawberry growers to produce better plants. Mycorrhizal fungi also form symbiotic associations with the roots of forest trees. This year we field-tested methods of applying mycorrhizal fungi to tree seedlings.

Corrosion Engineering

Studies continued in the stress corrosion behaviour of modified copper alloys. Two projects funded by the Defence Research Establishment Atlantic will determine the susceptibility of specific alloys to stress corrosion cracking in seawater service.

Friction losses in the conduit of cooling heat transfer media can be reduced by employing chemical additives as drag reducing agents. In collaboration with St. Mary's University, we are examining the compatibility of new drag-reducing agents with commercial corrosion inhibitors.

Coal Technology

We are working to identify and evaluate technologies for partial gasification of Nova Scotia coal. The Federal Department of Energy, Mines and Resources and the Committee on Atlantic Coal fund this project, which could produce a variety of new fuels.

Under contract with the Canadian Space Agency, we conducted an evaluation of the breakup of viscous liquid and coal slurry ligaments into drops in zero gravity conditions on board a NASA aircraft.

Wastewater Engineering

In support of the Sydney Tar Ponds Clean-Up Project we made laboratory and pilot-scale tests to assess various treatment options for removing polynuclear aromatic hydrocarbons from contaminated water, such as the decant water separated from the tar ponds sediment during the clean-up operation. We have developed the criteria for the full-scale treatment plant. The Sydney Tar Ponds Clean-Up Project is financed by a federal-provincial subsidiary agreement.

Information and Geophysics

This year Geophysics conceptually designed an explosion-proof geophysical borehole logging system for use in mines, assessed blasting criteria for a proposed new municipal ordinance, and interpreted seismic data for potash deposits in southern New Brunswick.

Following the decision to terminate contract geophysical surveys, much of the geophysics equipment was sold to diverse companies and institutes. We continue to offer geophysical data processing and interpretation services, and this year have made electrical and nuclear log measurements for hydrogeological, coal, salt and geotechnical programs of Nova Scotia industry.

The Nova Scotia Research Foundation Deep Tow Seismic Profiling System was rented and subsequently sold to a British survey company along with numerous spares which are part of our ongoing support for this system. An NSRFC surface tow streamer and streamer termination unit was constructed for a Canadian university.

From our database, we sold gravity data to a mineral exploration company. Our gravity data processing and interpretation software is now converted for use on a microcomputer.

INDUSTRY SERVICES

Field Service

The primary function of the Field Service Section is to deliver the National Research Council's (NRC) Industrial Research Assistance Program (IRAP) to industry in Nova Scotia. NRC has provided support for delivery of technical information and technology in this manner for more than 30 years. (More details on this relationship are provided in the Affiliates Section of this report.)

Delivering the IRAP Program puts Industrial Technology Advisors (ITA) in contact with small industry throughout the Province. Our ITAs are professional engineers/applied scientists who have worked in industry and can relate to small business people and their technical problems and opportunities. They are also part of a national network of ITAs located with other R&D centres. Therefore, when the client speaks to an ITA, he not only taps the ITAs personal expertise but he is also plugged in to the national ITA network.

We have three ITAs in Sydney, Truro, and Wolfville and three in Dartmouth. NRC supports five of these while the province supports the sixth and covers overhead costs for the whole group. One of our ITAs specializes in construction, one in food and the others in plant and industrial engineering.

In 1990/91 our ITAs made about 1300 industry visits. They responded to more than 3200 technical inquiries and delivered 114 IRAP contribution programs. Our ITAs together with six others in the province assisted more than 200 companies in accessing approximately $1.3 million of NRC funding support. Numerous others received advice and technical information relating to production problems, product development and new technology.

Project Services

Project Services provides a variety of specialist technical supports to industry and government departments on cost-recovery basis. This assistance is focused on providing technical/economic feasibility studies to Nova Scotia business and on providing technical assistance in the research, development and evaluation of equipment for the renewable-resource industries.

Among the projects completed this year were: a study of an innovative method of producing fishmeal, development of a control system for a mobile slush ice production system, feasibility of local manufacturing of in-mine borehole logging equipment, and development of improved fish-skinning equipment.

The group also carried out a number of projects on behalf of the Atlantic Farm Mechanization Institute including an analysis of forage handling systems, an evaluation of a pesticide safety tractor cab, development on a hay compactor, and calibration of a prototype fertilizer spreader.

Technical People In Industry

Transferring technology to a company or improving its existing technology requires in-house technical expertise. However, in Nova Scotia over 70% of small manufacturers do not have a scientist, engineer or technologist on staff.

ACOA (Atlantic Canada Opportunities Agency) accepted our proposal to demonstrate the positive impact of new technical skills primarily to smaller companies. The program supports added technical staff-members in firms by reimbursing a portion of their salaries for up to one year. The added technical skills must be new to the business in order to demonstrate to management the benefit of employing technical people. An advisor enhances the results by helping to make links to the science and technology community.

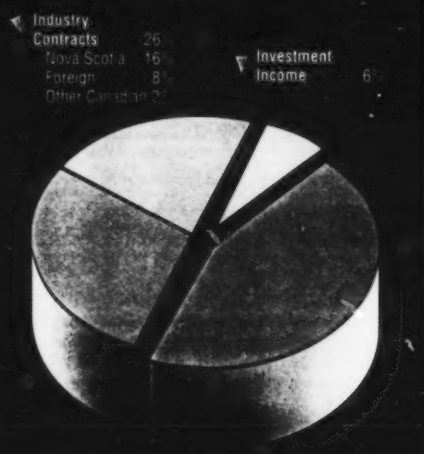
Approximately 50 Nova Scotia companies have benefited to date. In over 78% of the completed projects, the candidate or replacement has continued with the firm and accepted additional technical responsibilities. The advisor feature of the program has been used in 43% of the projects. The projects range from engineering design criteria, technology transfer, productivity improvements, process controls, formulation changes, crop development, and geographic information systems to quality control.

Library

A collection of approximately 20,000 books, journals and reports, an active inter-library loan procedure and access to over 400 databases on seven systems enables our Library to provide information, and access to information sources, to all divisions of the Corporation.

Financial Summary

REVENUE	1991	1990
Scientific and Engineering	$ 3,988,663	$ 3,250,736
Grant from Province of Nova Scotia	3,012,000	2,912,000
Investment Income	474,620	453,879
EXPENSES		
Scientific and Engineering	5,837,792	5,031,070
Administration	2,335,570	1,574,168
NET INCOME (LOSS)	($ 198,089)	11,376



AUDITOR'S REPORT

To the Chairman and Members of the Board of Directors of the Nova Scotia Research Foundation Corporation

I have audited the balance sheet of the Nova Scotia Research Foundation Corporation as at March 31, 1991 and the statements of revenues and expenses and retained earnings for the year then ended. These financial statements are the responsibility of the Corporation's management. My responsibility is to express an opinion on these financial statements based on my audit.

I conducted my audit in accordance with generally accepted auditing standards. Those standards require that I plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosure in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In my opinion, these financial statements present fairly, in all material respects, the financial position of the Corporation as at March 31, 1991 and the results of its operations for the year then ended in accordance with the accounting policies stated in Note 2 to the financial statements.

O.P. Cormier, F.C.A., Auditor General
Halifax, Nova Scotia, May 15, 1991

ASSETS	**1991**	**1990**
Current		
Cash	$ 1,116,158	$ 1,286,704
Short Term Investments	3,237,414	3,559,309
Accounts Receivable	1,600,430	787,271
Inventory	103,151	35,010
Work In Progress	49,337	65,922
	$ 6,106,490	$ 5,734,216
Funds and Investments (Note 3)		
Research Endowment Fund	1,000,000	1,000,000
Nova Scotia First Fund	12,741,984	11,261,763
Other Investments	21,614	13
	13,763,598	12,261,776
Fixed Assets		
Land and Buildings	2,843,267	2,873,132
Equipment	1,837,020	1,948,180
	4,680,287	4,821,312
	$ 24,550,375	$ 22,817,304

LIABILITIES AND EQUITY	**1991**	**1990**
Current		
Accounts Payable		
Trade	$ 568,443	$ 641,435
Province of Nova Scotia	3,903,220	4,057,218
Current Portion of Long Term Liability	239,038	–
Deferred Revenue	892,982	534,028
	5,603,683	5,232,681
Long Term		
Voluntary Early Retirement Plan (Note 5)	220,962	–
Fund Balances		
Research Endowment Fund	1,000,000	1,000,000
Nova Scotia First Fund	12,741,984	11,261,763
	13,741,984	12,261,763
Equity		
Contributed Surplus	4,680,287	4,821,312
Retained Earnings	303,459	501,548
	4,983,746	5,322,860
	$ 24,550,375	$ 22,817,304

Loan Guarantees (Note 4)

AUDITOR'S REPORT

STATEMENT OF RETAINED EARNINGS

For the year ended March 31, 1991

	1991	1990
Balance, Beginning of Year	$ 501,548	$ 490,171
Add: Net Income (Loss)	(198,089)	11,377
Balance, End of Year	$ 303,459	$ 501,548

STATEMENT OF REVENUES AND EXPENSES

For the year ended March 31, 1991

	1991	1990
Revenues		
Contracts (Note 6)	$ 3,716,763	$ 3,188,272
Grant from Province of Nova Scotia	3,012,000	2,912,000
	6,728,763	6,100,272
Expenses		
Scientific and Engineering	5,329,282	4,998,548
Administrative and Occupancy	2,335,570	1,574,168
	7,664,852	6,572,716
Loss Before Income From Discontinued Operations and Investment Income	936,089	472,444
Income From Discontinued Operations (Note 8)	263,380	29,942
Loss Before Investment Income	672,709	442,502
Investment Income		
Research Endowment Fund	120,346	114,415
Short Term Investments	352,674	339,464
Interest on Silvagen Debenture	1,600	0
Net Income (Loss)	($ 198,089)	$ 11,377

NOTES TO THE FINANCIAL STATEMENTS

March 31, 1991

1. Authority

The Nova Scotia Research Foundation Corporation was established in 1975 by the Act to Establish the Nova Scotia Research Foundation Corporation. Its purpose is to assist in the economic development of Nova Scotia by promoting, stimulating and encouraging the effective utilization of science and technology by industry and government.

2. Accounting Policies

These financial statements have been prepared in accordance with generally accepted accounting principles modified by the Corporation's accounting treatment of fixed assets described in (c) below.

a) *Short term investment*: Short term investments are valued at the lower of cost or net realizable value.

b) *Inventory and work in progress*: Inventory and work in progress are valued at the lower of cost or net realizable value.

c) *Fixed assets and contributed surplus*: Fixed assets are acquired by purchase, donation or construction. The costs of purchased capital additions and the fair market values of donated capital additions are recorded as fixed assets with an offsetting credit to contributed surplus. When fixed assets are constructed by the Corporation, the related material, labour and overhead costs are included as fixed assets in the year of expenditure. When fixed assets are acquired out of the general revenues of the Corporation, they are charged to expenses in the year of acquisition. When the costs of equipment have been carried on the Corporation's financial statements for ten years, that cost is removed from both the fixed asset and contributed surplus accounts.

d) *Government assistance*: Funds received for the acquisition of equipment are offset against the cost of this equipment. Funds received for operating expenses incurred are recorded as revenue in the same year as the expenses were incurred.

3. Funds and Investments

Research Endowment Fund – Subject to any directions provided by the Governor in Council, the Fund is administered and controlled by the Corporation. The Fund is invested in a Province of Nova Scotia 12% promissory note which will mature November 15, 1991.

Nova Scotia First Fund - On March 30, 1989 the Governor in Council approved an appropriation in the amount of $10,000,000 to establish the Nova Scotia First Fund. The objective of the Fund is to encourage the development of high technology industries and the adaptation of new technologies in existing industries. The Corporation has appointed a committee to manage the Fund and has formulated terms of reference, subject to the approval of the Board and the Governor in Council. At March 31, 1991 the investments of the Fund, including principal and accrued interest were as shown below.*

Other Investments - Other investments consist of a 20% ownership of Pathfinder Med Limited at a stated cost of $10, and 100% ownership of Nova Magnetics Limited at a stated cost of $3 and a $20,000 convertible debenture of Silvagen Inc. On December 5, 1995 the convertible debenture and its accrued interest, at the option of the Corporation, can be converted to common shares of Silvagen Inc. at a rate of one share for every $2, or can be repaid to the Corporation with total payment in any one year limited to 20% of Silvagen Inc.'s annual, after tax net income.

4. Loan Guarantees

The Corporation has provided a guarantee of $50,000 to the Royal Bank of Canada as security for a loan and line of credit from the bank to the Applied Microelectronics Institute.

5. Voluntary Early Retirement Plan

In February 1991, the Province of Nova Scotia announced its intention to implement a voluntary early retirement plan. As an outside agency, the Corporation was invited to participate providing it agreed to pay the Province all costs of the plan not covered by the Public Service Superannuation Fund. By a resolution of the Board of Directors on March 18, 1991 the Corporation's participation was authorized. An amount of $460,000 has been accrued and charged to expenses during the year. This amount represents management's best estimate of the present value of the future payments required under the plan. Of the total liability, $239,038 has been classified on the balance sheet as current and $220,962 has been classified as long term. Aggregate payments required in each of the next five years are as follows:

1991/92	$ 239,038
1992/93	54,382
1993/94	30,704
1994/95	31,932
1995/96	33,209

6. Government Assistance

Contract revenues include government assistance of $760,783 (1990 - $341,995) for direct expenses incurred under various federal and provincial agreements.

7. Commitments

The Corporation has constructed and is equipping an Environmental Test Centre (ETC Atlantic). The budgeted costs to construct and equip the facility are $2,564,230. The Atlantic Canada Opportunities Agency (ACOA) has agreed to provide capital funding of $1,500,000, the Province of Nova Scotia has contributed $584,230, and $480,000 is being contributed by the Corporation. Costs incurred and equipment contributed by the Corporation to March 31, 1991 totalled $2,256, 025. It is expected that the unspent balance of the ACOA grant will be used in the 1991/92 fiscal year.

8. Discontinued Operations

Effective April 1, 1990 the Corporation ceased performing geophysical survey work. During the year disposal of material assets used in this activity was carried out. Revenues and expenses associated with this activity were:

	1991	1990
Revenues	$ 271,890	$ 62,463
Expenses	8,510	32,521
	$ 263,380	$ 29,942

9. Reclassification of Prior Year's Figures

Certain of the prior year's figures have been reclassified to conform to the current year's presentation.

BALANCE SHEET

AS AT MARCH 31, 1991

* Investment	Amount	Rate	Maturity Date
Guaranteed Investment Certificate	717,051	9.00%	Apr. 5, 1991
Guaranteed Investment Certificate	5,331,032	11.60%	Sept. 30, 1991
Guaranteed Investment Certificate	1,501,202	9.75%	June 28, 1991
Guaranteed Investment Certificate	5,192,699	9.45%	Mar. 26, 1992
	$12,741,984		

PRODUCT DEVELOPMENT

Technology Transfer

Two years after transfer of our rotary product line to Focal Technologies Inc. of Dartmouth, that firm is flourishing. Focal has been very successful in penetrating the US and international markets and is becoming a significant exporter of Nova Scotia technology originally developed here at NSRFC.

Nova Magnetics Limited

During this year Nova Magnetics Limited (NML) entered into four contracts for the supply of our patented, high-efficiency magnetic drives for use on prototypes of high-horsepower petrochemical process pumps meeting the recently passed US clean air standards. The addition of NML drives to these large pumps eliminates one of the most serious causes of environmental pollution in the petrochemical industry — leaking pump shaft seals.

NML drives are also very attractive due to their high efficiency, which results in significant energy savings. The trial of our drives on prototypes, if successful, will lead to field trials and volume production. This market for our technology is very promising and is the prime focus of much of our activity.

Nova Magnetics Limited also continues to supply the worldwide diving industry with magnetically coupled gas circulators and systems. In order to market more cost-effectively in a shrinking market, NML has signed an agreement with Seaforth Kinergetics Ltd. of Aberdeen, Scotland. Seaforth will use our technology in all their life-support products in return for marketing rights outside North America for all our diving-related products. The merger of NML's technology with Seaforth's marketing capabilities should benefit both parties.

The Seaforth agreement, together with the transfer of our slip ring technology to Focal and our withdrawal from the geophysical deep-tow market has necessitated the termination of all our non-North American agency agreements.

In the North American diving market, NML has obtained a major contract extending into 1992 from MacDermott International to refurbish, improve and supply magnetic drives for the company's internal life-support systems. In addition, NML sold hyperbaric equipment to the navies of the USA, Spain and Italy.

The market for nuclear applications of NML's seal-less, leak-free technology remains slow in both fusion and fission projects.

Technical officer Bob [illegible] with [illegible]

CAD/CAM Services

In keeping with our mandate to maintain a state-of-the-art CAD/CAM capability we updated our equipment with personal workstations, new software and additional CAM equipment. We received financial assistance for this from the Canada/Nova Scotia Technology Transfer and Industrial Innovation Subsidiary Agreement.

The new workstations were installed in February 1991 and staff are busy learning and using the new system. The use of personal workstation and computer technology rather than mainframe computing allows us to demonstrate technology that is both affordable and appropriate for the small and medium-sized industry we particularly serve.

In the past year we provided free assistance in the application of CAD/CAM to fifteen Maritime companies. The service given was primarily in the CAD area. The current economic recession has led many companies to hold off on purchase of CAM machinery while the purchase of much less expensive CAD systems continues.

Quality Assurance Services

One of our vital quality assurance efforts is operating the Environmental Test Centre to CSA Z-299.3. In the past year we have assisted seven Nova Scotia small industries in implementing their quality assurance services to CSA standards. In addition we have provided assistance to the Department of Industry, Trade and Technology and the Department of Advanced Education and Job Training in the quality assurance area.

Environmental Test Centre Atlantic

Our new environmental test facility, ETC Atlantic, was officially opened in November 1990. Funded by ACOA and the Province of Nova Scotia, this new centre provides Atlantic Canadian manufacturers with their first cost-effective, accessible facility for testing their products under adverse environmental conditions.

ETC Atlantic offers a wide range of environmental exposure tests including temperature, humidity, altitude, thermal shock, vibration, mechanical shock, salt spray, rain, sunshine and high pressure. We test packages for suitability for transport of dangerous or infectious substances. We can also test the raw materials for strength, durability, hardness and corrosion resistance, and perform weld qualification tests.

In conjunction with marketing ETC Atlantic and building our client base we are also applying for recognition by various certifying bodies such as the Standards Council of Canada and the Department of National Defense.

Client Services

The division continues to serve industry in the fields of design, drafting, precision machining, forensic engineering and new product design and marketing.

AFFILIATES

IRAP and the Field Service

IRAP (Industrial Research Assistance Program) is a program of the National Research Council Canada (NRC) and is delivered to industry from coast to coast by 220 Industrial Technology Advisors (ITA). There is an NRC IRAP Provincial Coordinator in each province who organizes program activities, approves programs and provides a vital link to NRC in Ottawa and to other technical expertise throughout the network.

The objective of the IRAP program is to help industry acquire new scientific capabilities, new technologies and develop new and/or better products. ITAs have a multitude of ways to help their clients. Some of the more common are:

- IRAP C - This involves an ITA working one on one with a company on a technical problem. Through this interaction, clients often receive technical information from a literature search, or direct analysis and advice from the ITA or some other specialist within the network. (There are no charges for these services.)
- IRAP H - Through this funded program a company is reimbursed 85% of the salary cost of employing a science or engineering student for a work term.
- IRAP L - When a company has an immediate technical in-plant problem which requires the use of outside consulting expertise, it can apply for IRAP L assistance.
- IRAP M - This vehicle is used mainly to help a company with in-house research aimed at developing new or improved products or processes.

The IRAP offices' listing in the Yellow Pages under "Technology" symbolizes their trademark of accessibility to small and medium-sized industry. In Nova Scotia there are ITAs in Halifax, Dartmouth, Sydney, Truro and Wolfville.

Atlantic Farm Mechanization Institute (AFMI)

AFMI was created as a non-profit corporation in 1985 to carry out research, development and testing of agricultural and woodlot machinery in Atlantic Canada.

The year's projects included an analysis of forage handling systems, evaluation of a safety cab for use on tractors applying pesticides, calibration of a prototype fertilizer broadcaster, and assistance in the development of a hay compactor.

Atlantic Institute of Biotechnology (AIB)

AIB was incorporated in 1985 as an independent non-profit organization under the sponsorship of Dalhousie University, the Technical University of Nova Scotia, the Nova Scotia Research Foundation Corporation, and the Nova Scotia Agricultural College. Five-year funding was provided by the Department of Regional Industrial Expansion.

The mission of AIB is to assist industry in applying biological technology to increase productivity, competitiveness and profitability. AIB's mandate has been refined to these roles:

1. to encourage and assist clients to commercialize biological technical development and inventions
2. to encourage and assist clients to locate and apply technology for the improvement of their competitive strength
3. to advise clients in the management of technological change
4. to facilitate productive relationships between clients and government development and funding agencies, university and government scientists, private sector business consultants and business associations

The Technology Innovation Centre

Operated by the Nova Scotia Department of Industry, Trade and Technology, this full-service business incubator opened in the fall of 1987 and provides an atmosphere for accelerated growth to technology-based start-up companies.

In addition to providing a wide array of professional business services, the Technology Innovation Centre hosts over twenty personal upgrading and business-related seminars annually.

In 1991 we introduced an indepth, hands-on consulting assistance program for tenants of the centre and over twenty other local companies. This extensive government program is a joint effort of the Nova Scotia Department of Industry, Trade and Technology, Federal Business Development Bank and Canada Employment and Immigration Centres.

Applied Microelectronics Institute (AMI)

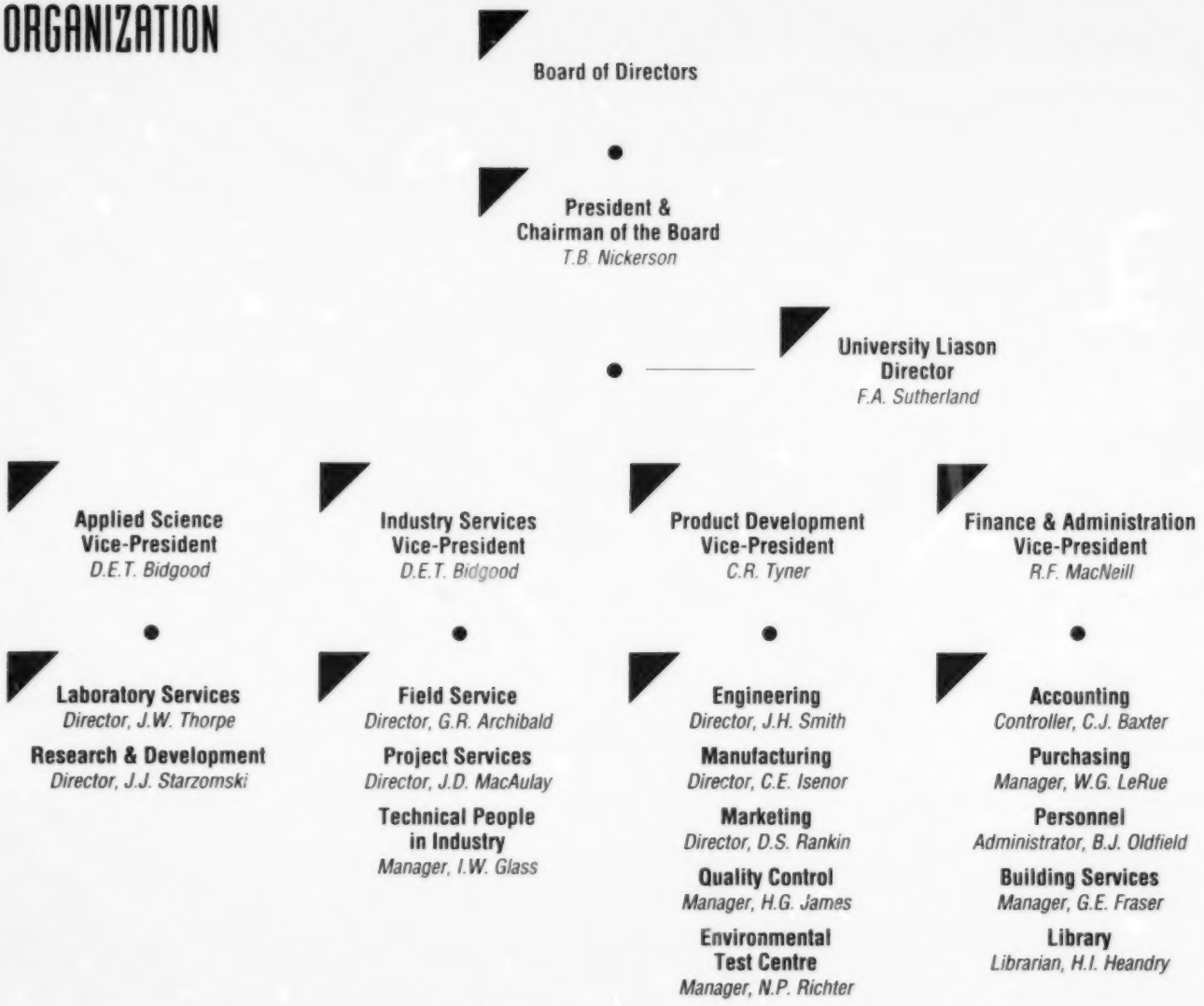
Founded in 1981 as a not-for-profit organization, AMI's objectives are:

- Developing expertise and initiatives relevant to the development of electronic-based products with a view to stimulating new business activity focused in Atlantic Canada
- Contributing to the competitiveness and development of industries, universities and government by working collaboratively with them and others to develop products and services which compete internationally.

AMI maintains a state-of-the-art facility oriented to the design and prototyping of electronic based systems. Capabilities supported include analog and high-speed digital simulation and testing, embedded multi-tasking software design, ASIC design, PCB CAD and surface mount prototyping.

A major measure of AMI's success is the degree to which new business activity is stimulated. Therefore, AMI does everything it can to encourage startup and expansion ventures producing products or services based on new or advanced technology.

ORGANIZATION



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PAPERS AND PUBLICATIONS

Boyle, C. D.; Hellenbrand, K. E. *"Assessment of the Effect of Mycorrhizal Fungi on the Drought Tolerance of Conifers."* presented at the 8th North American Conference on Mycorrhizae, Jackson Hole, Wyoming, September 5 - 8, 1990.

Cervelli, R. L. *"Effects of Aluminum and Abscisic Acid on In-Vitro Cloning of Somatic Embryos of Spruce (Picea)."* presented at the 40th Canadian Chemical Engineering Conference, Halifax, Nova Scotia, July 15 - 21, 1990.

Cervelli, R. L.; Brown, H. L. *"Potential Cost Reduction Protocols for Commercial Micropropagation of Strawberry."* presented at the Atlantic Plant Tissue Culture Association, Halifax, Nova Scotia, July 15 - 21, 1990.

Cervelli, R. L.; Hicks, G. *"Effects of pH and Aluminum on Somatic Embryo Development of White Spruce (Picea Glauca) and Red Spruce (P. Rubens)."* presented at the 5th Conifer Biotech Working Group Meetings, Sittingbourne, UK, July 9 - 13, 1990.

Hellenbrand, K. E.; Boyle, C. D. *"Development of Procedures for Inoculating Certified Strawberry Stock with Endomycorrhizal Fungi."* presented at the 8th North American Conference on Mycorrhizae, Jackson Hole, Wyoming, September 5 - 8, 1990.

Reade, A. E.; Hellenbrand, K. E. *"Assessment of the Quality of Seafood with the Limulus Amoebocyte Lysate Test."* presented at the 8th International Biodeterioration and Biodegradation Symposium, Windsor, Ontario, August 26 - 31, 1990.

Starzomski, J. J. *"Technical-Economic Studies on Advanced Direct Liquefaction of Nova Scotia Coal."* presented at the 40th Canadian Chemical Engineering Conference, Halifax, Nova Scotia, July 15 - 21, 1990.

Stover, N. S. H.; Thambimuthu, K. V.; Todd, A. *"The Effect of Dispersant and Stabilizer Type and Amount on the Rheological and Atomization Characteristics of Coal-Water Fuels."* presented at the 15th International Conference on Coal and Slurry Technologies, Clearwater, Florida, April 23 - 26, 1990.

Howells, K. and Roulston, B.V. *"Seismic Reflection Interpretation for Evaporites in the Moncton Subbasin, New Brunswick."* presented at the Atlantic Geoscience Society Colloquium on Current Research in the Atlantic Provinces, Amherst, Nova Scotia, February 8-9, 1991.

McKay, A.G. and Kishimoto, K. *"Processing of Deep-Tow Seismic Data, Oki Trough, Japan Sea."* Proceedings of the Society of Exploration Geophysicists of Japan, Koriyama, October, 1990.

Smith, J.H. and Oliver, J.B. *"Techniques for Eddy Current Reduction in Magnetic Drives using Metallic Containment Barriers."* presented at the International Pump Users Symposium in Houston, Texas, March 6, 1991.